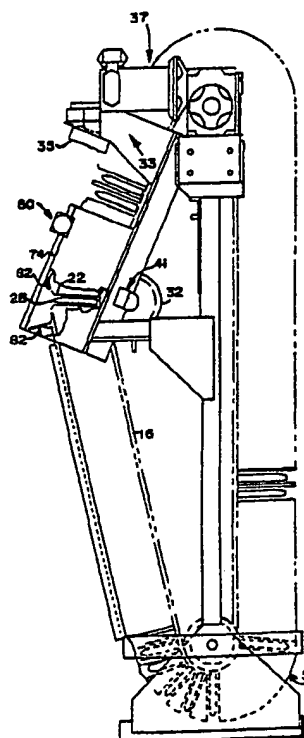




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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(54) Title: AUTOMATIC RENTAL VENDING MACHINE (57) Abstract <p>An automatic vending machine for the rental of video cassettes. Cassettes are stored in individual brackets (22) carried on a vertical conveyor belt (16). An indexing mechanism (41) indexes each bracket (22) and the code of the cassette therein is read by a bar code reader (35) and transmitted to a CPU (60). A service man randomly loads the machine and the reader (35) reads the codes of all the cassettes. A user inserts a credit card into slot (6) and selects a cassette using keyboard (10). The CPU moves the conveyor until a bracket holding the cassette is aligned with window (12). Upon return of the cassette, the user places the cassette in an empty bracket where it is subsequently moved to the reader to read the code thereon.</p>		



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AUTOMATIC RENTAL VENDING MACHINE

BACKGROUND OF THE INVENTION

The present invention is directed to the field of automatic rental vending machines, and in particular automatic rental vending machines for video cassettes.

Automatic video cassette vending machines are generally known to the art. Typically, the known apparatus operate along similar principles to customary candy or cigarette dispensing machines. A customer selects the video cassette he desires to rent, pays for the transaction, and thereafter presses a button or pulls a knob so that the selected cassette drops from a higher storage area within the machine into an opening or window area where it may be removed by the customer. The transactions usually involve a credit card and the vending apparatus includes means for receiving a customer's credit card, and recording a charge thereon equal to the value of the cassette. When the cassette is returned, the customer again inserts his credit card and the vending machine credits the customer with the difference between the price of the cassette and the rental value thereof. The machine records the date and time when the cassette is rented and the date and time when the cassette is returned so that the customer is charged the proper rental fee which is based on the number of days for which the cassette has been rented. The machines also include means for detecting that the cassette returned by the customer is the same cassette that was rented by him, which may be accomplished by bar coding the cassettes.

In the typical vending apparatus discussed above, returned cassettes are merely deposited in a storage area within the machine. At periodical intervals, the returned cassettes must be re-stacked in the machine so that they may again be dispensed to subsequent customers. If, for example, all cassettes for a particular movie are in the storage

which a customer may desire to rent may be physically within the vending machine, the consumer will be unable to make a transaction and a sale will be lost.

It is the primary object of the present invention to provide an automatic vending machine in which returned cassettes are immediately available for subsequent re-rental. It is a further object of the present invention to provide a vending machine in which it is unnecessary to manually move returned cassettes from a storage area to the dispensing area of the apparatus. A still further object of the invention is to provide a vending machine which can be loaded by a service man at random. It is still a further object of the invention to provide a novel conveyor system to accomplish the above results. Other objects and advantages of the invention will become evident from the following description thereof.

SUMMARY OF THE INVENTION

The improved automatic vending machine of the present invention includes a plurality of brackets carried by a vertical conveyor belt. Each bracket is coded by an indexing mechanism on the conveyor belt and adapted to receive video cassettes. A bar code reader is adapted to read bar codes on the stored cassettes. A memory stores the coded information to maintain a current record of the status of each bracket to determine whether designated video cassettes are present or absent and to record those cassettes not in inventory. The machine includes an opening proximate to the conveyor belt through which a customer may gain access to a designated bracket to remove a desired video cassette. In particular, a customer selects a video cassette by indicating a code corresponding to a particular cassette. The memory determines if such cassette is available, and if so, control means move the conveyor belt until a bracket holding the selected cassette is moved proximate to the opening in the machine where it may be removed by the customer. The customer returns the cassette by indicating the code number, after which the control means move the conveyor so that an empty bracket is moved proximate to the opening of the machine. The customer then inserts the returned cassette into its assigned bracket. The bar code reader reads the code of the returned cassette placing it back in inventory. The customer's credit card is then credited for the returned cassette.

It is apparent that the rented cassette is returned to an indexed bracket and the memory records the fact that the cassette has been returned. Accordingly, the returned cassette is immediately available for re-rental to a subsequent customer. There is no need for any periodic human intervention, as required by the prior art systems, to remove returned cassettes from a storage return area and re-stack them in assigned positions in a dispenser, thereby saving much time and labor.

Inventory can be loaded into the machine at random. The bar code reader and the indexing means cooperate to transmit the code of each type and its bracket position to a central processing unit.

In a further aspect of the invention, a novel conveyor-bracket arrangement is provided in which adjacent brackets carried on the conveyor belt may be pivoted relative to each other. The arms of each bracket define retaining means for cassettes carried in the bracket between them. A cassette may be removed from a bracket only by pivoting the two immediately adjacent brackets to displace the retaining means away from the intermediate bracket carrying a cassette to be removed. In this manner, the conveyor belt carrying the brackets may be a vertically oriented, rotating endless belt which will retain cassettes in their respective brackets. Means are provided for pivoting adjacent surrounding brackets to open an intermediate bracket proximate to the opening in the machine to enable a customer to remove a selected cassette from the intermediate bracket or to return a cassette assigned to that bracket.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a front elevational view of the automatic video cassette vending machine in accordance with the present invention;

FIGURE 2 is similar to FIGURE 1 illustrating the internal components of the machine and partially cut away to show a plurality of conveyor belts for carrying cassettes to be dispensed;

FIGURE 3 is a side elevational view of the conveyor system for the cassettes housed within the machine;

FIGURE 4 is an isolated view of part of a conveyor within the machine carrying brackets which receive video cassettes;

FIGURE 5 is similar to FIGURE 4 except that the bracket retaining means have been displaced to provide access to a cassette received in one of the bracket;

FIGURE 6 is a schematic diagram illustrating the components of the automatic vending machine in accordance with the present invention; and

FIGURES 7 and 8 are perspective views, partially cut away with its front door 11 open.

BEST MODE FOR CARRYING OUT THE INVENTION

Figures 1-6 of the drawings illustrate the preferred embodiment of an automatic rental vending machine in accordance with the present invention. Referring to Figure 1, the vending machine is generally designated by the reference numeral 2. The machine includes a CRT display screen 4 on which instructions relating to the operation of the machine are displayed for the customer. A credit card insertion slot 6 is provided to receive and record credit card information of the customer, and a slot 8 is provided through which the customer receives a receipt for his transaction. A keyboard 10 is used by a customer for indicating a reference numeral or other code corresponding to the video cassette to be rented. A window area or opening 12 is defined in the front of the machine through which a customer may gain access to video cassettes within the machine to complete the transaction.

Figure 2 of the drawings is similar to Figure 1 but is cut out to illustrate a vertically oriented conveyor system housed within the automatic vending machine. In particular, the machine includes three separate endless conveyor belts designated by the reference numerals 14, 16 and 18. Each of the three endless conveyor belts includes a plurality of brackets 20, 22 and 24, respectively, which are carried by the conveyor and extend outwardly and substantially normal to the plane of the endless conveyors. Each of the brackets receives and holds a video cassette designated by the reference numerals 26, 28 and 30, respectively. In Figure 2, the illustrated brackets holding video cassettes are aligned with the opening or window space 12 defined in the front surface of the machine. As will be discussed in further detail below, the machine includes means for selectively rotating the individual conveyor belts in order to transport a particular cassette selected by a customer to the opening 12 where the customer gains access to the cassette to complete the transaction.

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Each cassette is provided with a bar code 27, 29 and 31. The machine also comprises a bar code scanner or reader generally indicated at 33. It comprises a conventional scanner head 35 mounted on a motorized track mechanism generally indicated at 37. The conveyor indexing means or encoder is generally indicated at 41.

Figure 3 of the drawing illustrates a side elevational view of the path of travel of one of the conveyor belts 16 housed within the machine. As shown in Figure 2, the conveyor 16 is stopped at a position in which bracket 22 holding cassette 28 is in alignment with the window access opening 12 defined in the front of the vending machine. A shaft or cam 32 is provided in alignment with window opening 12 to cause the conveyor belt 16 to abruptly change its direction of travel as it passes through the region proximate to the opening 12. As will be discussed in greater detail below, the abrupt change of direction of the endless conveyor results in the pivoting of brackets immediately adjacent to bracket 22 for the purpose of displacing cassette retaining means so that the cassette within a cassette box 28 can be removed from the bracket 22 by the customer.

Figure 4 of the drawings illustrates an isolated section of the conveyor belt 16 which has been generally illustrated in Figures 2 and 3. The conveyor belt 16 includes a plurality of individual conveyor links 34 which are pivotally mounted to each other to define the endless conveyor loop 16. Each conveyor link 34 carries a bracket which extends substantially perpendicular to the upper surface of the link. In Figure 4 the bracket 22, as illustrated in the previous drawings, is shown sandwiched between two adjacent brackets 36 and 38 carried on the upper surface of adjacent conveyor links 34. Each bracket includes a plurality of arms 39 which define the upper and lower surfaces and the two ends of the individual bracket. Moreover, each of the arms defining the upper and lower surfaces of a bracket terminate in a portion which is bent substantially perpendicular to the respective arm and oriented in a direction towards the nearest adjacent bracket. For illustrative

purposes, it is noted that the bent end portion 40 of the arm of bracket 38 is directed towards, and extends into, the area defined by the immediately adjacent bracket 22. Likewise, the arms of bracket 36 immediately adjacent to the intermediate bracket 22 terminate in bent end portions which extend into the area defined by the intermediate bracket 22. It is noted that the arms defining the immediately adjacent surfaces of adjacent brackets are slightly laterally spaced apart from each other as illustrated in Figure 4 so that the adjacent arms of adjacent brackets may be pivoted into a common plane.

Referring now to Figure 5, the portion of the conveyor 16 illustrated in Figure 4 is shown in a position in which adjacent brackets 36 and 38 are pivoted relative to the intermediate bracket 22. As noted above, the conveyor links 34 supporting the brackets 22, 36 and 38 are pivotally mounted to each other. Actual pivoting of the brackets 36 and 38 occurs as a result of the abrupt change of direction of the endless conveyor 16 caused by shaft 32 illustrated in Figure 3. When adjacent brackets 36 and 38 are pivoted relative to the intermediate bracket 22, the bent perpendicular end portions defined on the free ends of the arms of the adjacent brackets, which otherwise extend into the area defined by the intermediate bracket 22, are displaced. The bent end portions of the adjacent brackets serve as retaining means to hold the video cassette box 28 within the intermediate bracket 22 as the vertically oriented conveyor 16 rotates. However, when the adjacent brackets 36 and 38 are pivoted relative to the intermediate bracket, these retaining means are displaced from the intermediate bracket 22 and the cassette box 28 may be removed by a customer to complete a transaction. It is noted that the machine is arranged so the pivoting resulting from the change of direction of the conveyor occurs proximate to the opening 12 in the front of the machine so that the customer has access to the opened bracket and may remove the cassette therefrom through the opening 12.

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As also seen in Figures 4 and 5, each cassette box 28 is provided with an opening 43 through which the bar code on the actual cassette may be read. The box 28 manufactured according to U.S. Patent No. 4,184,594, is provided with channels 45 at each end into which end bracket arms 47 fit when the box is inserted correctly with opening 43 facing outwardly. The box will not fit into the bracket with the opening facing inwardly. This is prevented by upstanding tabs 49 at the end of channels 45. The misfit of the box 28 will keep it sticking out where it is detected by an optical sensor to thus prevent return in a way that the bar code could not be read.

Slings generally indicated at 51 are provided to hold the tapes in place, when the conveyors turn around at the bottom of the machine.

Figure 6 of the drawings is a diagrammatic view of the vending machine in accordance with the present invention. The major components of the machine include a central processing unit designated by the reference numerals 60, a printer control board designated by the reference numerals 62, a card reader designated by the reference numeral 64, electronic circuitry 66 for the keyboard 10 of Figure 1, and electronic circuitry 68 for the CRT display 4 also illustrated in Figure 1. The printer, card reader and keyboard are all electrically coupled to the central processing unit.

Referring to Figures 7 and 8, three doors 70, 72 and 74 are located behind the opening 12. These doors may be individually opening by attached motorized rack and pinion mechanisms generally indicated at 76, 78 and 80. Note rack 81 attached to door 74. An individual cassette box 30 is accessible when door 74 is open and access to other cassette boxes is prevented by shield 82. The door is provided with an automatic locking mechanism and a mechanism for indicating whether the door is open or closed to the central processing unit. Such a mechanism is generally indicated at 84 for door 74.

To operate a machine the machine is first loaded with cassette boxes containing cassettes in a loading cycle in

which all three doors 70, 72 and 74 are opened and the conveyors indexed together one conveyor slot at a time. Alternatively, one door may be opened and tapes replaced selectively in the associated conveyor by a serviceman. The technician randomly loads the cassettes into the machine. As the loaded cassettes pass the bar code scanner 33, the scanner head 35 passes over the openings 43 in the boxes and reads the bar codes from each of the three aligned cassettes in the three conveyors. This loads the central processing unit memory with the inventory in the machine.

A customer rents a video tape by inserting a credit card into the machine which is read. The credit card information is stored in the central processing unit. Thereafter, the customer punches a code on the keyboard corresponding to the video cassette which he desires to rent. The CRT display may be used to provide the customer with instructions for operating the machine and the numerical codes corresponding to the different cassettes contained within the machine. After the customer has made a selection by punching the appropriate reference numeral on the keyboard, the printer provides the customer with a receipt indicating appropriate information such as the identification of the credit card, the identification of the video cassette selected, and the date and time of the transaction.

After the customer has made a selection of the particular cassette which he wishes to rent by indicating the corresponding code number on the keyboard, the central processing unit searches its inventory to see whether or not that cassette is available. If it is not, the customer is provided with an appropriate message. If the selected cassette is available, the central processing unit communicates with a motor to rotate the conveyor belts until a bracket containing one of the selected tapes, since there may be more than one stored in the machine, is aligned behind one of the three doors 70, 72 and 74. The appropriate door is then opened and cassette box containing the tape may be removed by the customer. As discussed above, when the chosen bracket is in this position, the two immediately adjacent surrounding brackets are pivoted to displace cassette retaining means away from the assigned bracket so that

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the customer may gain access to and remove the selected video cassette from the machine through the opening 12. The door is then closed, the transaction completed and the customer provided with the receipt.

When a customer returns a video cassette, the above described operations are repeated. In particular, the customer punches the number on the key board corresponding to the cassette to be returned. The central processing unit causes the conveyor system to rotate so that an empty bracket is transported to the opening 12. The appropriate door is opened and the customer inserts the returned tape. As also discussed above, when this occurs, the retaining means for the assigned bracket are displaced so that the bracket is opened and the returned cassette can be inserted directly into the empty bracket.

The door is closed and the conveyors are indexed so that the returned cassette is below the scanner head 35. The scanner head 35 is then traversed across the three aligned bar codes including that of the returned tape and this information is transmitted to the central processing unit which returns the return tape to inventory and credits the customer for the return of that tape. The issued receipt further indicates the cost of the rental which is based upon the time that the cassette has been removed from the machine. The difference in the cost of the tape and the rental cost is credited to the customer's credit card.

It is apparent from the above discussion that the automatic vending machine described herein is advantageous in many respects over the known apparatus. In particular the cassettes may be loaded randomly, the vending machine maintains a current record in memory of the status of its entire inventory including the total number and type of cassettes assigned to the machine, the number and type of cassettes which are in the machine and available for immediate rental, and the number and type of cassettes which have been rented. More importantly, the bar code and location of a returned cassette is immediately recorded in the central processing unit memory, so that the returned cassette is immediately

available for subsequent re-rental. Unlike the known prior art machines, the machine described herein eliminates the requirement to transfer returned cassettes from a storage area to a cassette dispenser before the returned cassettes become available for re-rental. Accordingly, the present invention provides a machine which is completely automated in all respects and requires no human intervention whatsoever.

Other advantages and modifications within the scope and spirit of the invention will be evident to those skilled in the art. Accordingly, the discussion of the best mode of the invention described herein is intended to be illustrative only, and not restrictive of the scope of the invention, that scope being defined by the following claims and all equivalents thereto.

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CLAIMS

1. An automatic rental vending machine comprising:
movable storage means within said machine for holding coded articles to be rented and for receiving returned rented articles, each of said articles being stored in a single article storage area defined in said movable storage means,

code reading means for reading the codes of articles which are stored in said storage areas,

code storage means for storing the codes of the articles stored in each of said single article storage areas,

control means coupled to said movable storage means for moving said storage means to a position to provide access to a selected storage area from outside of the machine for removing or replacing articles in said designated storage area.

2. The machine as claimed in claim 1 further comprising:

indexing means coupled to said movable storage means and said control means.

3. The machine as claimed in claim 1 wherein said control means causes said code reading means to read the code of an article immediately after it has been stored in said machine and causing its code and storage area to be stored in said code storage means.

4. The machine as claimed in claim 1 wherein said movable storage means comprises a conveyor.

5. The machine as claimed in claim 4 wherein said conveyor includes said predetermined storage areas carried thereon.

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6. The machine as claimed in claim 5 wherein said predetermined storage areas are defined by a plurality of brackets.

7. The machine as claimed in claim 6 wherein said conveyor is an endless conveyor comprising conveyor links which are pivotally mounted to each other.

8. The machine as claimed in claim 7 further comprising means for pivoting a plurality of said conveyor links at a predetermined position in said machine.

9. The machine as claimed in claim 8 wherein said means for pivoting comprises a shaft coupled to said conveyor for causing said conveyor to vary its direction of travel.

10. The machine as claimed in claim 8 wherein adjacent brackets define retaining means for intermediate brackets and said retaining means are displaceable to open said intermediate brackets in response to pivoting of said adjacent brackets.

11. The machine as claimed in claim 10 wherein said retaining means for said intermediate brackets comprise folded end portions integrally defined on arms of said adjacent brackets, said folded end portions being configured and oriented to extend into said storage areas defined by said intermediate brackets.

12. The machine as claimed in claim 8 further comprising an opening defined in the front of said machine, said opening being defined proximate to said predetermined position in said machine at which said conveyor links are pivoted.

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13. The machine as claimed in claim 12 further comprising a cover over said opening, and means for opening said cover, said means for opening said cover being coupled to said control means.

14. An automatic rental vending machine comprising:
a housing,
a vertically oriented conveyor in said housing,
individual storage compartments for holding preassigned articles carried by said conveyor,
an opening defined in said housing for providing access to said storage compartments proximate to said opening; and
control means coupled to said conveyor for selectively moving a predetermined one of said storage compartments proximate to said opening in said housing.

15. The machine as claimed in claim 14 further including retaining means for said storage compartments.

16. The machine as claimed in claim 15 wherein said retaining means for one of said storage compartments is defined on said storage compartments immediately adjacent thereto.

17. The machine as claimed in claim 16 wherein said storage compartments are pivotal relative to each other, and said retaining means for said predetermined storage compartment is displaced by pivoting said adjacent storage compartments.

18. The machine as claimed in claim 14 further including a cover locked over said opening, and means for unlocking said cover coupled to said control means.

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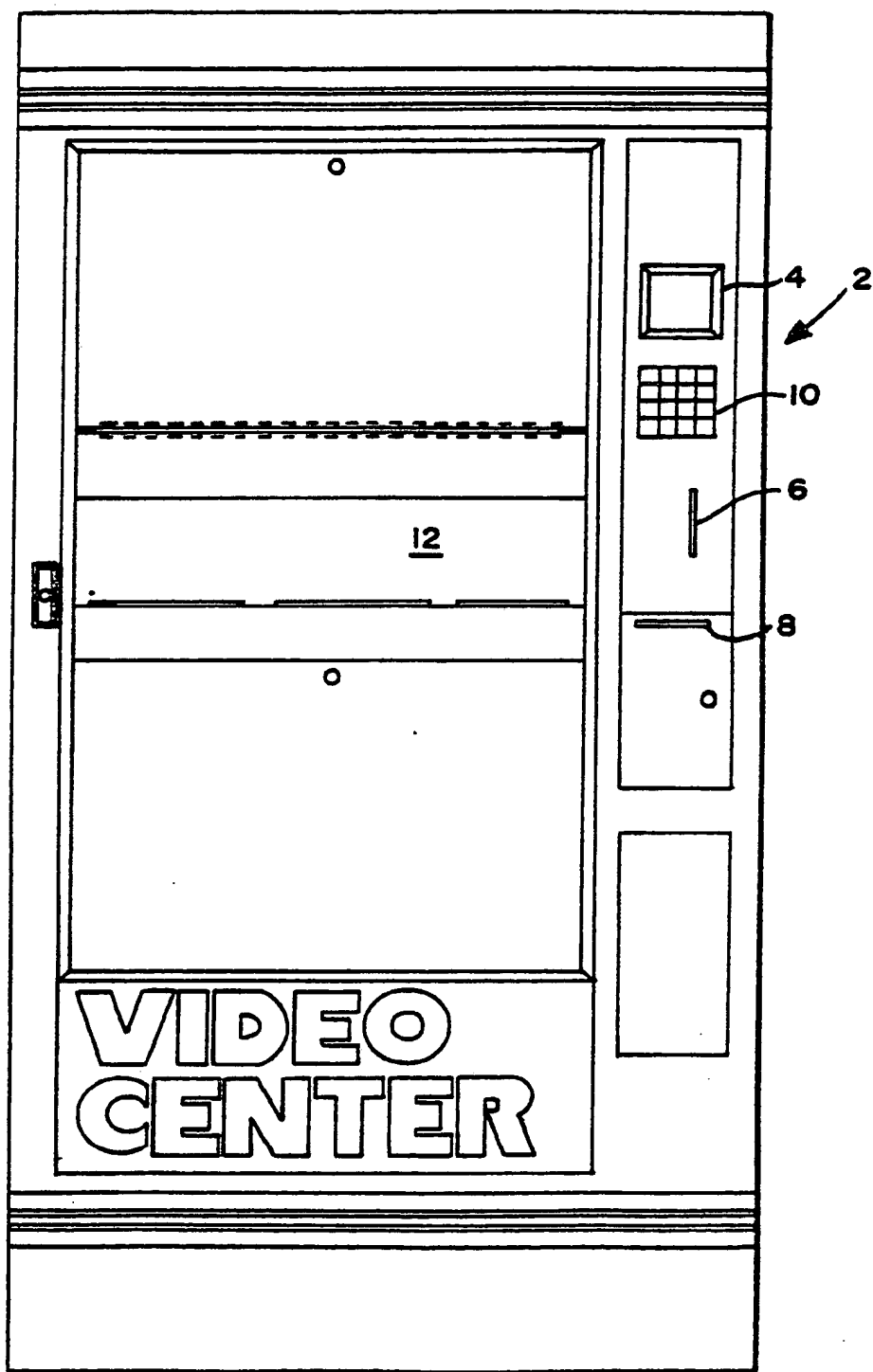
19. In an automatic vending machine for articles to be rented, said machine comprising means for storing and dispensing said articles, the improvement comprising:

said storage and dispenser means including an endless conveyor formed from a plurality of pivotally mounted conveyor links, and a plurality of storage compartments for said articles carried on said conveyor links.

20. The machine of claim 19 wherein said storage compartments comprise at least an intermediate storage compartment and an adjacent storage compartment disposed on each side of said intermediate storage compartment, each of said storage compartments being defined by brackets, the ends of said brackets defining said adjacent storage compartments extending into said intermediate storage compartment to provide retaining means for said intermediate storage compartment, and means for pivoting said adjacent storage compartments relative to said intermediate compartment to displace said retaining means from said intermediate storage compartment.

21. A machine as defined in claim 3 wherein said control means moves said movable storage means to a position to provide access to a selected unfilled storage area which may not have originally stored a tape to be returned.

FIG. 1



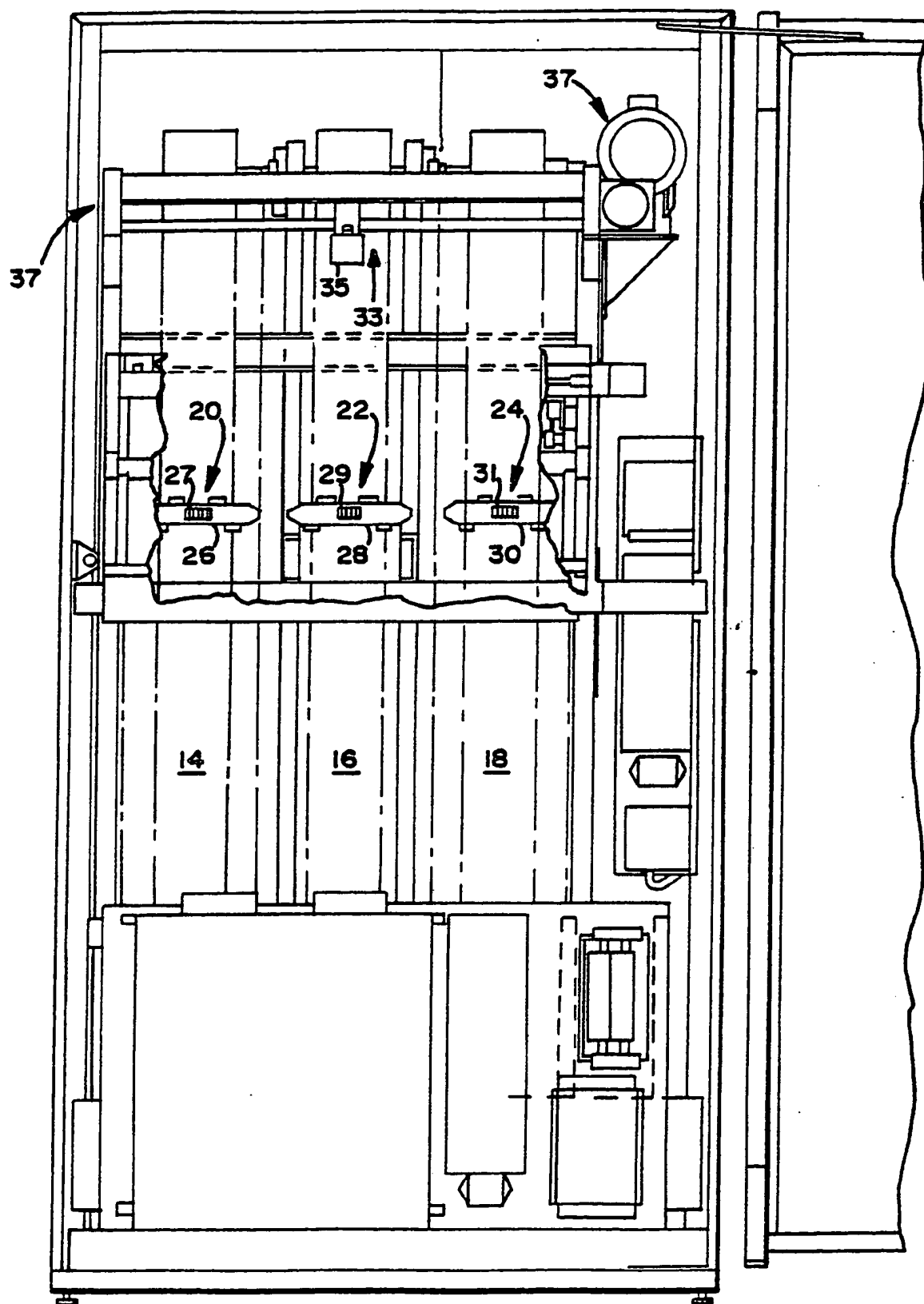
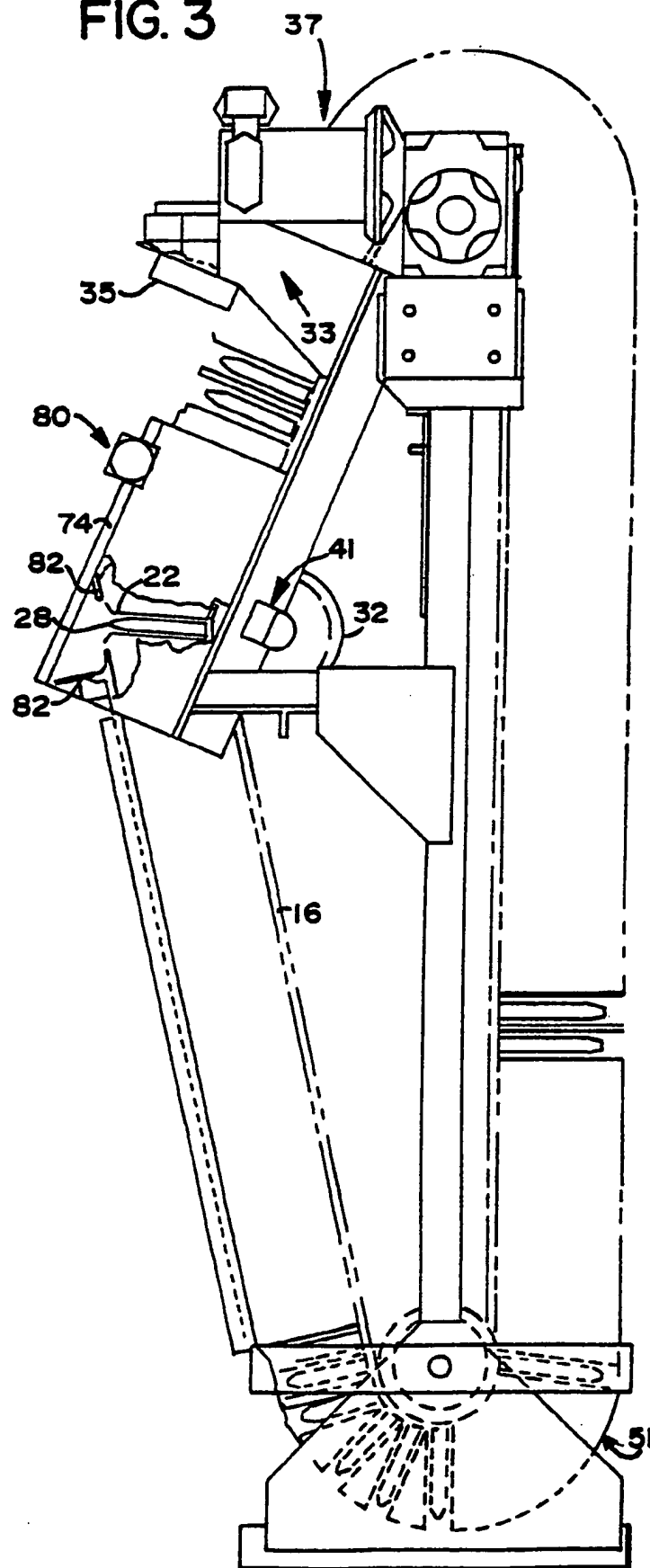


FIG. 2

SUBSTITUTE SHEET

FIG. 3



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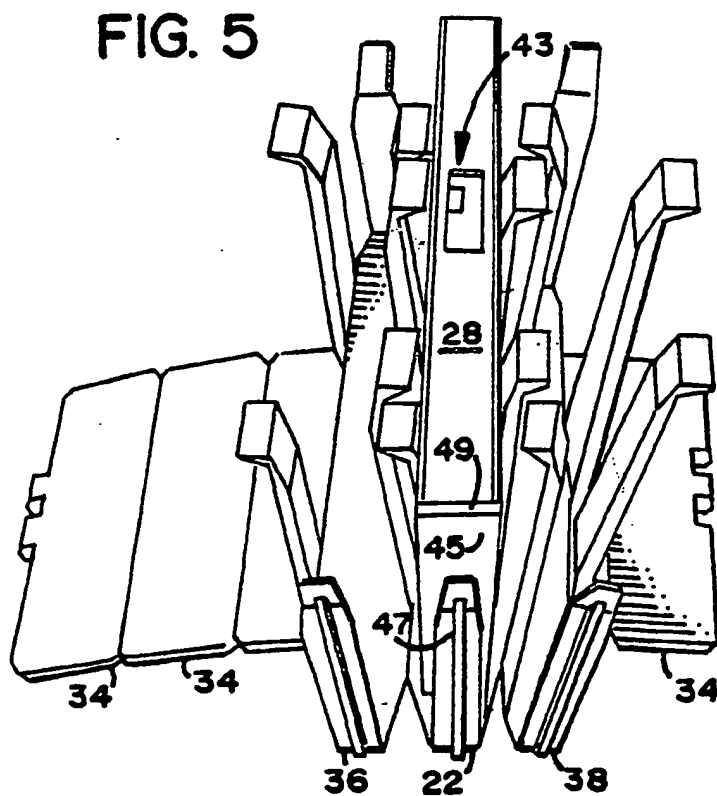
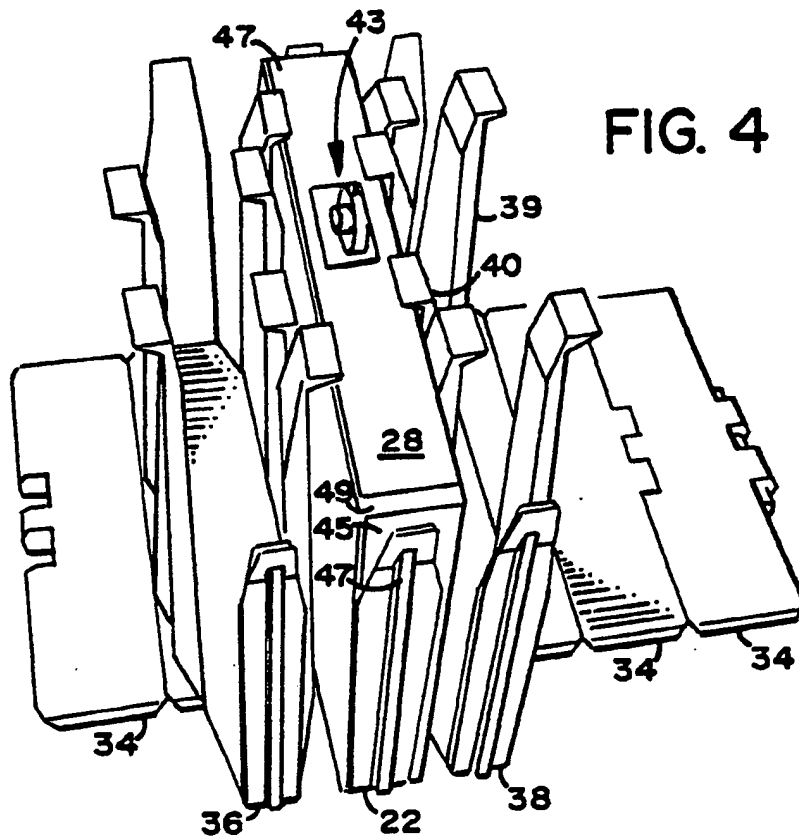


FIG. 6

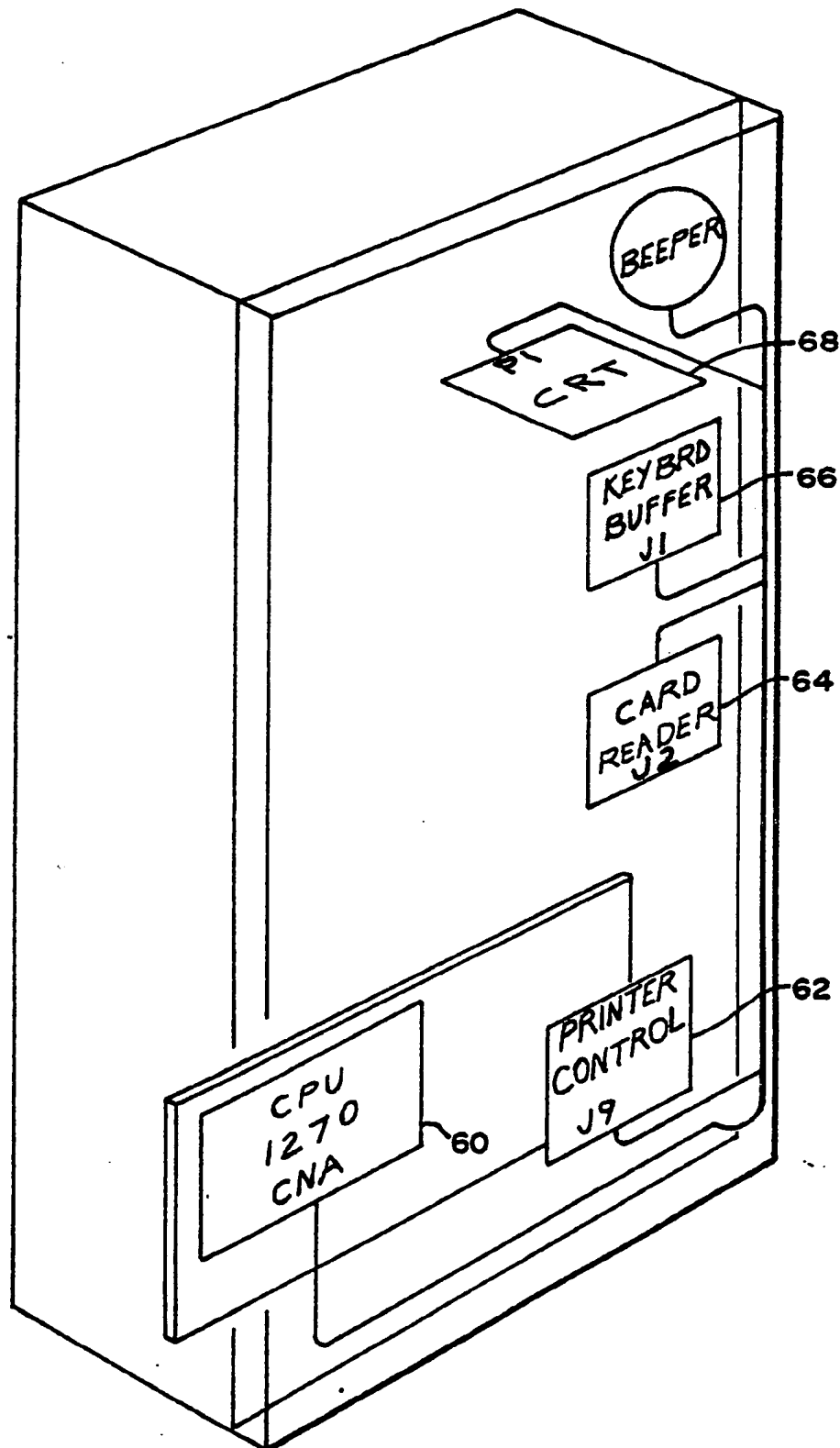


FIG. 7

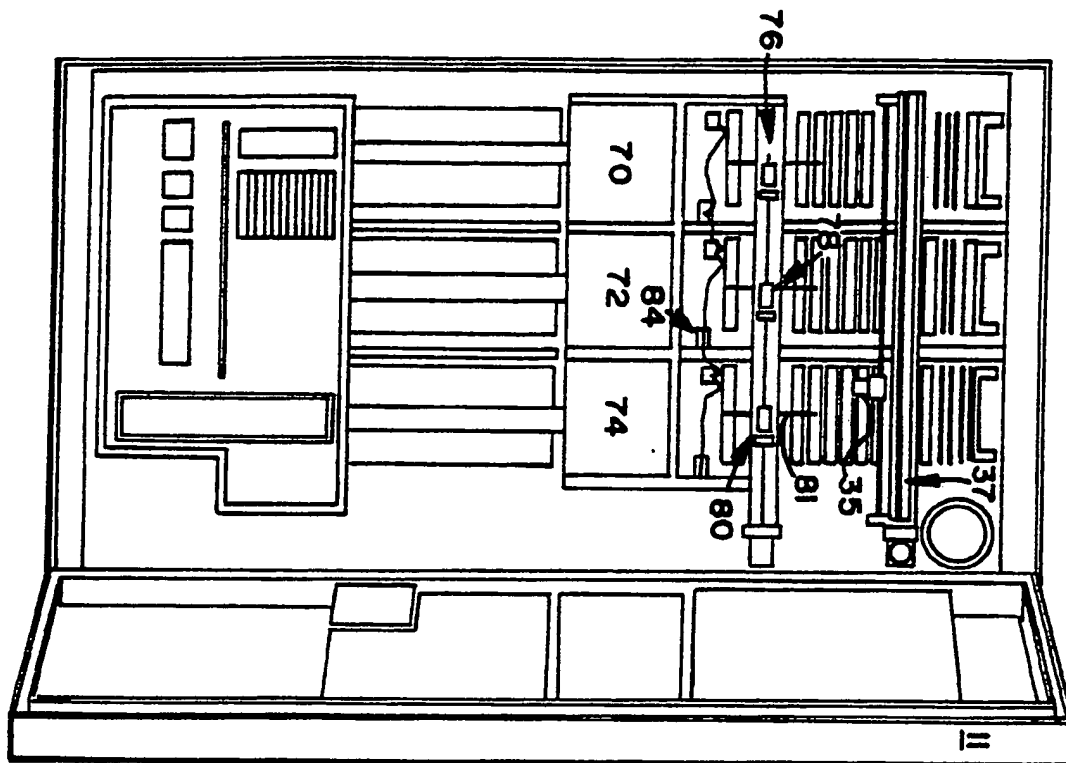
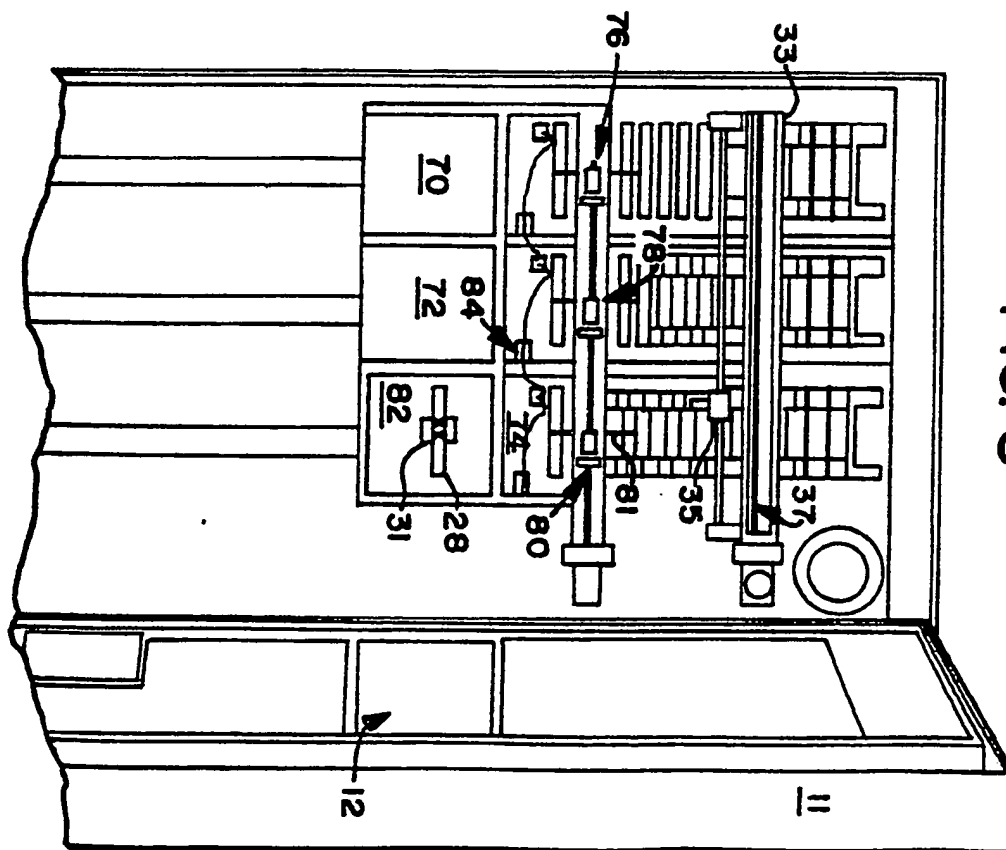
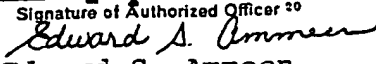


FIG. 8



INTERNATIONAL SEARCH REPORT

International Application No. PCT/US 87/02335

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³		
According to International Patent Classification (IPC) or to both National Classification and IPC IPC (4): G07F 7/00; G07F 7/06 U.S. CL. 194/205; 221/77, 89; 198/803.13		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁴		
Classification System	Classification Symbols	
U.S.	194/205, 210, 350 221/12, 76, 77, 89, 90 198/484.1, 803.1, 803.13	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ^{1,4}		
Category ⁶	Citation of Document, ^{1,6} with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸
X Y	US, A, 4,458,802, (MACIVER et al) 10 July 1984 See column 4, lines 34-62; column 7, lines 33-41; Figures 1, 2, 21	1-6, 21 7-13
Y	US, A, 3,722,743, (ATCHLEY) 27 March 1973 See the entire document	7-19
Y	US, A, 784,622, (LINDEMANN et al) 14 March 1905 See page 2, lines 1-38	11
X	US, A, 4,519,522, (MCELWEE) 28 May 1985 See the entire document	1-6, 21
A	US, A, 4,494,675, (STUTSMAN) 22 January 1985	
X,P	DE, A, 3,518,476, (SCHREIBER) 27 November 1986 See the abstract	1-8, 12-15, 18-19, 21
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>¹⁵ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p> </div> </div>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search ³		Date of Mailing of this International Search Report ³
27 October 1987		14 DEC 1987
International Searching Authority ¹		Signature of Authorized Officer ²⁰
ISA/US		 Edward S. Ammeen